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EXAMINER	
CRUTCHFIELD, CHRISTOPHER M	
ART UNIT	**PAPER NUMBER**
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

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Office Action Summary	**Application No.** 10/583,079	**Applicant(s)** DEMACHI ET AL.	
	Examiner Christopher Crutchfield	**Art Unit** 2466	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 June 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-33* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7, 9-12, 19, 23, and 26-33* is/are rejected.

7)☒ Claim(s) *8,13-18,20-22,24 and 25* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claim 31 is objected to because of the following informalities: multiply dependent claims must be in the alternative form only. See 37 CFR 1.75. Claim 31 is directed to “any one of claims 28 to 30” and is therefore not in the alternative, it is suggested that the claim language be changed to “claims 28 to 30”. Appropriate correction is required.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out

the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. **Claims 2 and 4** are rejected under 35 U.S.C. 103(a) as being unpatentable over *Chin*, et al. (US Patent No. 6,163,543) in view of The IEEE 802.3ad Standard (Author Unknown, IEEE 802.3ad Standard-2000, IEEE Press, March 2000, Pages 1-183), *Xu*, et al. (US Pre Grant Publication No. 2005/0002365) and *Cristensen*, et al. (M. Christensen and F. Solensky, Considerations for IGMP and MLD Snooping Switches, Pages 1-25, October 2003).

Regarding claim 2, *Chin* discloses a communication control system for controlling communications performed between a plurality of communication stations that are connected to communication paths being multiplexed with a main path and a sub-path, the communication control system comprising:

a. First communication function implementing sections which are multiplexed so as to correspond with the main path and the sub-path respectively, and each of which implements a communication function in a physical layer of an OSI hierarchical model (Fig. 2, Element 224 and Column 3, Lines 40-51). (The system of *Chen* discloses the use of a link aggregation protocol for aggregating links from one or more servers [i.e. Communication Stations][Fig. 2, Element 228]. Each communication station has two physical links to the adjacent switch via separate physical network interfaces [Fig. 2, Element 224 and Column 3, Lines 40-51]. The system operates by aggregating data to be transmitted at the data link layer [using a “second communication function section”]

by assigning a common data link layer [i.e. MAC] address to both of the physical links and transmitting data to the peer device using the assigned MAC address [Column 16, Lines 15-34 and Column 17, Line 47 to Column 18, Line 4]. The system may further implement sorting to separate packets to be transmitted into two prioritized groups [forming the high and low priority communication sections] [Column 17, Lines 16-36] and may then transmit the priority data over a first connection [i.e. the main path] until the main path fails, in which case both the high and low priority data are transmitted over the second connection [i.e. the sub path] when the link collapses to using one path for both transmission [Column 11, Line 55 to Column 12, Line 2 and Column 17, Line 58 to Column 18, Line 4].)

b. A second communication function implementing section which corresponds with the multiplexed first communication function implementing sections and implements a communication function in a data link layer of the OSI hierarchical model (Column 16, Lines 15-34 and Column 17, Line 47 to Column 18, Line 4 - See (a), Supra).

c. A high-priority communication section for performing a high-priority communication via the first communication function implementing section and the second communication function implementing section each corresponding to any one of the multiplexed communication paths (Column 17, Lines 16-36 - See (a), Supra).

d. A low-priority communication section for performing a low-priority communication via the first communication function implementing section and the second communication function implementing section each corresponding to the sub-path, wherein the high-

priority communication section and the low-priority communication section coexist in a single communication station (Column 17, Lines 16-36 - See (a), Supra).

e. Wherein the second communication function implementing section includes an address storing section for storing MAC addresses communication function implementing section and a transmitting section which attaches the MAC address to a communication frame and transmits the communication frame to the communication path (Column 16, Lines 15-34 and Column 17, Line 47 to Column 18, Line 4). (The system of *Chen* discloses that the link aggregation port is assigned a single multicast address which is stored by the data link layer protocol and is appended to all transmissions from the aggregated port [Column 16, Lines 15-34 and Column 17, Line 47 to Column 18, Line 4]).

Chin fails to disclose the use of two separate link layer second communication function implementing sections such that the second communication function implementing sections are multiplexed so as to correspond with the multiplexed first communication function implementing sections respectively, and each of which implements a communication function in a data link layer of the OSI hierarchical model and the a high-priority communication section for performing a high-priority communication via the first communication function implementing section and the second communication function implementing section each corresponding to any one of the multiplexed communication paths and a low-priority communication section for performing a low-priority communication via the first communication function implementing section and the second communication function implementing section each corresponding to the sub-path. In

the same field of endeavor, The IEEE 802.3ad standard discloses the use of two separate link layer second communication function implementing sections such that the second communication function implementing sections are multiplexed so as to correspond with the multiplexed first communication function implementing sections respectively, and each of which implements a communication function in a data link layer of the OSI hierarchical model and the a high-priority communication section for performing a high-priority communication via the first communication function implementing section and the second communication function implementing section each corresponding to any one of the multiplexed communication paths and a low-priority communication section for performing a low-priority communication via the first communication function implementing section and the second communication function implementing section each corresponding to the sub-path (Page 97, Figure 43-2). (The system of The IEEE 802.3ad Standard discloses that a separate data link/MAC layer is present on each of the aggregated interfaces and is associated with a corresponding Physical Layer Interface [Page 97, Figure 43-2 - Everything below the "802.3 MAC Service Interface").

Therefore, since The IEEE 802.3ad Standard suggests the use of separate data link layer interfaces for each physical layer interface, it would have been obvious to a person of ordinary skill in the art at the time of the invention to combine the separate data link layers of The IEEE 802.3ad Standard with the system of *Chin* by implementing two second communication functions, one for each physical layer device, as taught by The IEEE 802.3ad Standard and then linking the high and low priority communication section with each, as taught by *Chin*. The motive to combine is to allow for full data link layer redundancy be providing two data link layer communication functions.

Chin as modified by The IEEE 802.3ad Standard fails to disclose the second communication function implementing section includes an address storing section for storing

MAC addresses corresponding to the high-priority communication section and the low-priority communication section respectively, a transmitting section which attaches the corresponding MAC address to a communication frame depending on whether a transmission requestor is the high-priority communication section or the low-priority communication section, and transmits the communication frame to the communication path. In the same field of endeavor, *Xu* discloses the second communication function implementing section includes an address storing section for storing MAC addresses corresponding to the high-priority communication section and the low-priority communication section respectively, a transmitting section which attaches the corresponding MAC address to a communication frame depending on whether a transmission requestor is the high-priority communication section or the low-priority communication section, and transmits the communication frame to the communication path. (The system of *Xu* discloses that a multicast transmitter stores both unicast and multicast MAC destination addresses and attaches the appropriate address depending on the type of transmission [Paragraph 0027]. *Xu* further discloses that it is well known that audio and video data [Such as the priority audio and video discussed in *Chin* - See Column 17, Lines 16-32] may be transmitted using multicast [Abstract].)

Therefore, since *Xu* suggests transmitting video data using a multicast and storing and attaching separate MAC addresses for multicast and unicast data, and *Chin* suggests transmitting audio and video data at higher priority, it wouel have been obvious to a person of ordinary skill in the art at the time of the invention to combine the MAC based video multicasting of *Xu* with the prioritized audio and video of *Chin* by transmitting the audio and video using a multicast address, as taught by *Xu*, via the high priority communication section of *Chin*, and recalling and attaching the appropriate multicast or unicast MAC address for the communication

type, as taught by *Xu*. The motive to combine is to use link layer multicasting to transmit priority audio and video.

Chin as modified by The IEEE 802.3ad Standard and *Xu* fails to disclose a receiving section which compares a destination MAC address of a communication frame received from the first communication function implementing section with the MAC address stored in the address storing section, and when a match is found in the comparison result, sends the received communication frame to the corresponding communication section. In the same field of endeavor, *Cristensen* discloses a receiving section which compares a destination MAC address of a communication frame received from the first communication function implementing section with the MAC address stored in the address storing section, and when a match is found in the comparison result, sends the received communication frame to the corresponding communication section (Pages 1 and 7-10). (The system of *Cristensen* discloses the use of IGMP snooping to separate multicast and unicast traffic at the data link layer [Page 1, Abstract]. The system operates by storing a multicast MAC address associated with each multicast flow and separating data associated with the multicast address based on the destination MAC ["DMAC"] address [Pages 7-10][Particularly Page 7, Section 5].)

Therefore, since *Cristensen* discloses the separation of multicast traffic using a multicast destination MAC address that is distinct from a unicast destination address, it would have been obvious to a person of ordinary skill in the art at the time of the invention to use the multicast separation of *Cristensen* to separate out the high priority data of *Chin,* such as multimedia audio and video tagged with a destination multicast MAC address by using the destination multicast address to sort the multicast/high priority and unicast/low priority data at the receiving node. The motive to combine is to allow for the separation of multicast high priority data from low priority data.

Regarding claim 4, *Chin* fails to disclose a communication control system further comprising a multicast address storing section for storing a plurality of MAC multicast addresses, wherein when a destination MAC address of a communication frame received from the communication path matches with any one of the addresses stored in the MAC multicast address storing section, the second communication function implementing section sends the communication frame to the high-priority communication section, and otherwise the second communication function implementing section sends the communication frame to the low-priority communication section. In the same field of endeavor, *Cristensen* discloses a communication control system further comprising a multicast address storing section for storing a plurality of MAC multicast addresses, wherein when a destination MAC address of a communication frame received from the communication path matches with any one of the addresses stored in the MAC multicast address storing section, the second communication function implementing section sends the communication frame to the high-priority communication section, and otherwise the second communication function implementing section sends the communication frame to the low-priority communication section (Pages 1 and 7-10). (The system of *Cristensen* discloses the use of IGMP snooping to separate multicast and unicast traffic at the data link layer [Page 1, Abstract]. The system operates by storing a multicast MAC address associated with each multicast flow and separating data associated with the multicast address based on the destination MAC ["DMAC"] address [Pages 7-10][Particularly Page 7, Section 5].)

Therefore, since *Cristensen* discloses the separation of multicast traffic using a multicast destination MAC address that is distinct from a unicast destination address, it would have been obvious to a person of ordinary skill in the art at the time of the invention to use the multicast separation of *Cristensen* to separate out the high priority data of *Chin,* such as multimedia audio and video tagged with a destination multicast MAC address by using the destination multicast

address to sort the multicast/high priority and unicast/low priority data at the receiving node. The motive to combine is to allow for the separation of multicast high priority data from low priority data.

6. **Claims 6, 19, 20 and 23** are rejected under 35 U.S.C. 103(a) as being unpatentable over *Robertson*, et al. (A. Robertson, Linux-HA Heartbeat System Design, Pages 2-12, October 14, 2002) in view of *Chin*, et al. (US Patent No. 6,163,543), *Miltz* (H. Miltz, Linux High Availability How-To, Chapters 6 and 8, Pages 1-17, 22 December 1998) and RFC 3170 (B. Quinn and K. Almeroth, IP Multicast Applications: Challenges and Solutions, Pages 1-28, September 2001).

Regarding claim 6, *Robertson* discloses a communication control system for controlling communications performed between a plurality of communication stations that are connected to communication paths being multiplexed with a main path and a sub-path, the communication control system comprising:

a. A communication section for performing a communication via the main path (Pages 4-5). (The system of *Roberton* discloses a high availability clustering system where the individual cluster members track the availability of other cluster members by using multicast heartbeats [Pages 4-5]. The system of *Robertson* further discloses that each cluster member may use redundant Layer 1 connections including different active and backup links [i.e. the main and sub paths] in order to exchange cluster communications, including heartbeats [Page 4 "Communication Reliability", Third Full Paragraph]. The communication links may be Ethernet and the active and backup links may operate

using the same [i.e. both using Ethernet] or different [i.e. Ethernet and Serial] communications methods [Page 4, "Communication Methods", Fourth Full Paragraph - Showing that the primary link is Ethernet and that the secondary link may be either serial [i.e. ”many cluster systems also implement heartbeat mechanisms which work on independent communication methods”] or may be Ethernet [i.e. those cluster systems which do not work on independent methods]].)

b. A communication section for performing a communication via the sub-path (Pages 4-5, See (a), Supra).

c. A path diagnosing section for diagnosing a soundness of the main path and the sub-path (Pages 4-6). (The system of *Robertson* further discloses that the system tracks the availability of both the active and backup paths [Page 4, “Communication Reliability”, Third Paragraph]. By using heartbeats on both the active and backup paths of each cluster member [Page 4, “Communication Reliability”, Fourth Paragraph][Page 5, “Major design Decisions" - "Send all messages across all communication paths all the time. Report link failures, even when redundant links are still working.”]. Each heartbeat may be transmitted using a multicast to all member nodes in the cluster [Page 5, “Heartbeat’s Reliable Multicast Protocol”]. Each individual system tracks the availability of other cluster nodes based on the heartbeat multicasts received from the other nodes [Page 3, "Low Level Cluster Membership"][Page 9, "Cluster Consensus Membership" - "Heartbeat provides only a local view of cluster membership. That is, it only knows about or is aware of each node’s own individual view of the cluster…”].)

d. Wherein the path diagnosing section includes:

i. A path state storing section for storing path state information of a path state from a home station to each communication station (Pages 3 and 9). (The system of *Robertson* discloses that the system tracks the availability of each of the other cluster members by tracking if it receives multicast heartbeats from that cluster member [Page 4, See also (a), Supra] [Page 3, "Low Level Cluster Membership"][Page 9, "Cluster Consensus Membership" - "Heartbeat provides only a local view of cluster membership. That is, it only knows about or is aware of each node's own individual view of the cluster…"]. If a cluster member fails to receive heartbeats from another cluster member because of link failure of the primary and backup paths, then the member is removed from the list of available cluster members.)

ii. A fixed-cycle path diagnosing section for diagnosing the communication path from the home station to each communication station in a fixed cycle wherein the fixed-cycle path diagnosing section registers the path state information obtained from the diagnosis result, in the path state storing section (Page 3, "Low Level Cluster Membership"). (Each cluster member periodically [i.e. in a fixed cycle] transmits and receives diagnostic multicast heartbeats [Page 3, "Low Level Cluster Membership"]. The periodic multicast heartbeats are used to diagnose link availability of the redundant local links and are also used to determine the availability of remote cluster members [Page 5, "Major Heartbeat Design Decisions" - "Send all messages across all communications paths all the time.

Report link failures, even when redundant links are still working.”] [Page 3, "Low Level Cluster Membership"]. Remote cluster member availability over the communications path as reflected by the receipt of periodic hello messages is stored at each cluster node [i.e. the path state to the node is stored in a path state storing section] [Page 3, "Low Level Cluster Membership"].)

iii. The fixed-cycle path diagnosing section broadcasts a path diagnosis packet in accordance with a multicast protocol of Internet Protocol, over the main path and the sub-path respectively (Page 5, “Major Heartbeat Design Decisions” and “Heartbeat’s Reliable Multicast Protocol”). (Each node transmits heartbeats over all available connections, including both the active and backup connections [Page 5, “Major Heartbeat Design Decisions”]. The mode of transmission may be a multicast heartbeat [Page 5, ““Heartbeat’s Reliable Multicast Protocol”].)

Robertson fails to disclose the active and the backup paths may comprise separate high and low priority paths such that the switch further comprises a high-priority communication section for performing a high-priority communication normally via the main path and a low-priority communication section for performing a low-priority communication via the sub-path and a switching section for switching the communication path of the high-priority communication to the sub-path when the main path is diagnosed as faulty as a result of diagnosis by the path diagnosing section (i.e. *Robertson* is not concerned with how non-diagnostic data is prioritized or transmitted between cluster members, as it is directed towards a protocol for discovering cluster and link availability). In the same field of endeavor, *Chin* discloses the active and the backup paths may comprise separate high and low priority paths such that the switch further

comprises a high-priority communication section for performing a high-priority communication normally via the main path and a low-priority communication section for performing a low-priority communication via the sub-path and a switching section for switching the communication path of the high-priority communication to the sub-path when the main path is diagnosed as faulty as a result of diagnosis by the path diagnosing section (Column 17, Lines 16-36). (The system of *Chin* discloses a link aggregation system that allows a server to aggregate together outgoing links [Column 6, Lines 52-65]. *Chin* further discloses that the server may prioritize the outgoing data and may assign priority data to one of the paths and non-priority data to another of the sub-paths [Column 17, Lines 16-36]. Finally, *Chin* discloses that the two paths will collapse into a single path carrying both the priority and the non-priority data when the path heartbeat detects teh priority path has failed [Column 11, Line 55 to Column 12, Line 2 and Column 17, Line 58 to Column 18, Line 4].)

Therefore, since *Chin* suggests the use of a high and low priority path with failover, it would have been obvious to a person of ordinary skill in the art at the time of the invention to combine the priority and failover of *Chin* with the system of *Robertson* by having each cluster node split its traffic into high and low priority traffic and route each type on a separate link until the high priority link fails, at which time all traffic is routed on the remaining link. The motive to combine is to allow higher bandwidth and lower latency for the high priority traffic.

Robertson fails to disclose that the multicast heartbeats are sent separately between the high and low priority paths such that each communication station performs broadcasting by using a multicast corresponding to a path selected between the main path and the sub-path, and receives a path diagnosis packet of which destination matches with each of the main path and the sub-path. In the same field of endeavor, *Miltz* discloses the multicast heartbeats are sent separately between the high and low priority paths such that each communication station

performs broadcasting by using a multicast corresponding to a path selected between the main path and the sub-path, and receives a path diagnosis packet of which destination matches with each of the main path and the sub-path (Sections 8.1, 8.4 and 6). (The system of *Miltz* discloses the use of the Linux-HA cluster system of *Robertson* and further discloses that heartbeat packets are used to check link availability and are sent between the service/high priority links of each cluster node and the standby/low priority links of each cluster node [Section 8.4].)

Therefore, since *Miltz* disclose the multicast paths on the main and sub paths do not overlap, it would have been obvious to a person of ordinary skill in the art at the time of the invention to combine the separate paths of *Miltz* with the system of *Robertson* by transmitting the multicasts on the main and sub paths using separate multicast paths. The motive to combine is to allow the availability of both the main and the sub path to be tested separately.

Robertson as modified by *Chin* and *Miltz* fails to disclose that the main and the sub path are each assigned a separate multicast address such that each communication station performs broadcasting by using the IP multicast address corresponding to a path selected between the main path and the sub-path, as a destination IP address, and receives a path diagnosis packet of which destination IP address matches with the IP multicast address corresponding to each of the main path and the sub-path. In the same field of endeavor, RFC 3170 discloses the main and the sub path are each assigned a separate multicast address such that each communication station performs broadcasting by using the IP multicast address corresponding to a path selected between the main path and the sub-path, as a destination IP address, and receives a path diagnosis packet of which destination IP address matches with the IP multicast address corresponding to each of the main path and the sub-path. (The system of RFC 3170 discloses that separate multicast groups are established and linked to separate multicast IP addresses when multicasts are to be sent to different receivers [For example, the main and sub

path receivers] [See Sections 1 and 2 - Showing a multicast associates a receiver group with an IP address, requiring multiple multicast addresses for different groups]. RFC 3170 further discloses the use of a “many-to-many” multicast in which all members of a group can multicast to all other group members, which can be used for Synchronizing Resources and Concurrent Processing [i.e. Cluster Computing] [Section 3.2].)

Therefore, since RFC 3170 suggests the use of separate multicast groups and addresses for different receiver groups and the use of many-to-many multicasting in cluster computing, it would have been obvious to a person of ordinary skill in the art at the time of the invention to use separate many-to-many groups, as taught by RFC 3170 to scope the multicasts of *Robertson* as modified by *Chin* and *Miltz* so that only the proper paths receive each multicast. (i.e. create a separate IP Multicast group and IP address for the main and sub paths to prevent heartbeats from the main path form being received on the sub path and vice-versa). The motive to combine is to conserve bandwidth by appropriately scoping multicasts so that only the desired recipients receive the communication.

Regarding claim 19, *Robertson* discloses a communication control system further comprising an authentication section which performs authentication between the high-priority communication sections in different communication stations so as to enable communication between the authenticated communication stations (Pages 6-7). (The system of *Robinson* uses authentication to verify the multicast heartbeat communications [Pages 6-7].)

Regarding claim 20, *Robertson* discloses a communication control system further comprising an authentication section which performs authentication between the high-priority communication sections in different communication stations so as to enable communication between the authenticated communication stations (Pages 6-7). (The system of *Robinson* uses authentication to verify the multicast heartbeat communications [Pages 6-7].)

Regarding claim 23, *Robertson* discloses a communication control system wherein a router for performing a path control of the communication path in accordance with Internet Protocol is provided on the communication path, and the communication path includes a plurality of sub-networks being interconnected by the router (Pages 8-9, "True Multicast" - Indicating that if the proposed multicast is adopted, the cluster may bridge across IP subnets with an intervening router).

7. **Claims 26 and 27** are rejected under 35 U.S.C. 103(a) as being unpatentable over *Robertson*, et al. (A. Robertson, Linux-HA Heartbeat System Design, Pages 2-12, October 14, 2002), *Chin*, et al. (US Patent No. 6,163,543), *Miltz* (H. Miltz, Linux High Availability How-To, Chapters 6 and 8, Pages 1-17, 22 December 1998) and RFC 3170 (B. Quinn and K. Almeroth, IP Multicast Applications: Challenges and Solutions, Pages 1-28, September 2001) as applied to claim 6, supra and further in view of *Chen,* et al. (J. Chen Z. Wang, Y. Sun, Real Time Capability Analysis for Switch Industrial Ethernet Traffic Priority-Based, Pages 525-529, 2002).

Regarding claim 26, *Robertson* fails to disclose the high-priority communication section performs communication in accordance with a protocol dedicated to process control, and the low-priority communication section performs communication in accordance with an open standard protocol. In the same field of endeavor, *Chen* discloses the high-priority communication section performs communication in accordance with a protocol dedicated to process control, and the low-priority communication section performs communication in accordance with an open standard protocol (Pages 526-528, Sections II to IV). (The system of *Chen* discloses that high priority is used for process control traffic and that other traffic is transported using lower priority [Page 527, Section IV).

Therefore, since *Chen* suggests the use of high priority for transporting process control traffic and lower priorities for other traffic and *Robertson* as modified by *Chin* suggests that the other traffic may comprise traffic according to one of several "open" standards, it would have been obvious to a person of ordinary skill in the art at the time of the invention to combine the high priority process control traffic of *Chen* with the *Robertson* as modified by *Chin* by assigning high priority to control traffic and low priority to all other traffic. The motive to combine is to allow rapid transmission of critical process control data.

Regarding claim 27, *Robertson* as modified by *Chin* discloses that the communication traffic may comprise image data transfer (i.e. Video Frames) (See the modification of *Robertson* by *Chin* in claim 6, Supra). *Robertson* as modified by *Chin* fails to disclose a communication control system wherein the high-priority communication section transfers at least one of process data, an operation amount and an alarm, and the low-priority communication section performs at least one of image data transfer, file transfer and message transfer. In the same field of endeavor, *Chen* discloses a communication control system wherein the high-priority communication section transfers at least one of process data, an operation amount and an alarm, and the low-priority communication section performs at least one of image data transfer, file transfer and message transfer (Pages 526-528, Sections II to IV). (The system of *Chen* discloses that high priority is used for process control traffic and that other traffic is transported using lower priority [Page 527, Section IV).

Therefore, since *Chen* suggests the use of high priority for transporting process control traffic and lower priorities for other traffic and *Robertson* as modified by *Chin* suggests that the other traffic may comprise video frames/images, it would have been obvious to a person of ordinary skill in the art at the time of the invention to combine the high priority process control traffic of *Chen* with the *Robertson* as modified by *Chin* by assigning high priority to control traffic

and low priority to all other traffic. The motive to combine is to allow rapid transmission of critical process control data.

8. **Claims 28 and 29** are rejected under 35 U.S.C. 103(a) as being unpatentable over *Robertson*, et al. (A. Robertson, Linux-HA Heartbeat System Design, Pages 2-12, October 14, 2002) in view of *Chin*, et al. (US Patent No. 6,163,543).

Regarding claim 28, *Robertson* discloses a communication control system for controlling communications performed between a plurality of communication stations that are connected to communication paths being multiplexed with a main path and a sub-path, the communication control system comprising:

a. A communication section for performing a communication via the main path (Pages 4-5). (The system of *Roberton* discloses a high availability clustering system where the individual cluster members track the availability of other cluster members by using multicast heartbeats [Pages 4-5]. The system of *Robertson* further discloses that each cluster member may use redundant Layer 1 connections including different active and backup links [i.e. the main and sub paths] in order to exchange cluster communications, including heartbeats [Page 4 "Communication Reliability", Third Full Paragraph]. The communication links may be Ethernet and the active and backup links may operate using the same [i.e. both using Ethernet] or different [i.e. Ethernet and Serial] communications methods [Page 4, "Communication Methods", Fourth Full Paragraph - Showing that the primary link is Ethernet and that the secondary link may be either serial [i.e. ”many cluster systems also implement heartbeat mechanisms which work on

independent communication methods"] or may be Ethernet [i.e. those cluster systems which do not work on independent methods]].)

b. A communication section for performing a communication via the sub-path (Pages 4-5, See (a), Supra).

c. A path diagnosing section for diagnosing a soundness of the main path and the sub-path (Pages 4-6). (The system of *Robertson* further discloses that the system tracks the availability of both the active and backup paths [Page 4, "Communication Reliability", Third Paragraph]. By using heartbeats on both the active and backup paths of each cluster member [Page 4, "Communication Reliability", Fourth Paragraph][Page 5, "Major design Decisions" - "Send all messages across all communication paths all the time. Report link failures, even when redundant links are still working."]. Each heartbeat may be transmitted using a multicast to all member nodes in the cluster [Page 5, "Heartbeat's Reliable Multicast Protocol"]. Each individual system tracks the availability of other cluster nodes based on the heartbeat multicasts received from the other nodes [Page 3, "Low Level Cluster Membership"][Page 9, "Cluster Consensus Membership" - "Heartbeat provides only a local view of cluster membership. That is, it only knows about or is aware of each node's own individual view of the cluster…"].)

Robertson fails to disclose the active and the backup paths may comprise separate high and low priority paths such that the switch further comprises a high-priority communication section for performing a high-priority communication normally via the main path and a low-priority communication section for performing a low-priority communication via the sub-path and

a switching section for switching the communication path of the high-priority communication to the sub-path when the main path is diagnosed as faulty as a result of diagnosis by the path diagnosing section (i.e. *Robertson* is not concerned with how non-diagnostic data is prioritized or transmitted between cluster members, as it is directed towards a protocol for discovering cluster and link availability). In the same field of endeavor, *Chin* discloses the active and the backup paths may comprise separate high and low priority paths such that the switch further comprises a high-priority communication section for performing a high-priority communication normally via the main path and a low-priority communication section for performing a low-priority communication via the sub-path and a switching section for switching the communication path of the high-priority communication to the sub-path when the main path is diagnosed as faulty as a result of diagnosis by the path diagnosing section (Column 17, Lines 16-36). (The system of *Chin* discloses a link aggregation system that allows a server to aggregate together outgoing links [Column 6, Lines 52-65]. *Chin* further discloses that the server may prioritize the outgoing data and may assign priority data to one of the paths and non-priority data to another of the sub-paths [Column 17, Lines 16-36]. Finally, *Chin* discloses that the two paths will collapse into a single path carrying both the priority and the non-priority data when the path heartbeat detects the priority path has failed [Column 11, Line 55 to Column 12, Line 2 and Column 17, Line 58 to Column 18, Line 4].)

Therefore, since *Chin* suggests the use of a high and low priority path with failover, it would have been obvious to a person of ordinary skill in the art at the time of the invention to combine the priority and failover of *Chin* with the system of *Robertson* by having each cluster node split its traffic into high and low priority traffic and route each type on a separate link until the high priority link fails, at which time all traffic is routed on the remaining link. The motive to combine is to allow higher bandwidth and lower latency for the high priority traffic.

Regarding claim 29, *Robertson* discloses the path diagnosing section includes a path state storing section for storing path state information of a path state from a home station to each communication station and a fixed-cycle path diagnosing section for diagnosing the communication path from the home station to each communication station in a fixed cycle, wherein the fixed-cycle path diagnosing section registers the path state information obtained from the diagnosis result, in the path state storing section (Pages 3 and 9). (The system of *Robertson* discloses that the system tracks the availability of each of the other cluster members by tracking if it receives multicast heartbeats from that cluster member [Page 4, See also (a), Supra] [Page 3, "Low Level Cluster Membership"][Page 9, "Cluster Consensus Membership" - "Heartbeat provides only a local view of cluster membership. That is, it only knows about or is aware of each node's own individual view of the cluster…"]. If a cluster member fails to receive heartbeats from another cluster member because of link failure of the primary and backup paths, then the member is removed from the list of available cluster members. In addition, each cluster member periodically [i.e. in a fixed cycle] transmits and receives diagnostic multicast heartbeats [Page 3, "Low Level Cluster Membership"]. The periodic multicast heartbeats are used to diagnose link availability of the redundant local links and are also used to determine the availability of remote cluster members [Page 5, "Major Heartbeat Design Decisions" - "Send all messages across all communications paths all the time. Report link failures, even when redundant links are still working."] [Page 3, "Low Level Cluster Membership"]. Remote cluster member availability over the communications path as reflected by the receipt of periodic hello messages is stored at each cluster node [i.e. the path state to the node is stored in a path state storing section] [Page 3, "Low Level Cluster Membership"].)

9. **Claims 31-33** are rejected under 35 U.S.C. 103(a) as being unpatentable over *Robertson*, et al. (A. Robertson, Linux-HA Heartbeat System Design, Pages 2-12, October 14, 2002) and *Chin*, et al. (US Patent No. 6,163,543) as applied to claims 28 and 29 and further in view of *Jungmaier*, et al. (A. Jungmaier and M. Tuzed, On the use of SCTP in Failover Scenarios, Pages 363-368, July 14-18, 2002).

Regarding claim 31, *Robertson* discloses re-transmitting heartbeats (Page 5, "Heartbeat's Reliable Multicast Protocol"). *Robertson* fails to disclose a communication control system further comprising a data transmitting section which transmits data to another communication station, and retransmits the data when a normal reception response is not returned from the another communication station within a predetermined time and a data receiving section for returning a normal reception response to a transmitting source when data is normally received. In the same field of endeavor, *Jungmaier* discloses a communication control system further comprising a data transmitting section which transmits data to another communication station, and retransmits the data when a normal reception response is not returned from the another communication station within a predetermined time and a data receiving section for returning a normal reception response to a transmitting source when data is normally received (Page 365, Section 3.3). (The system of *Jungmaier* tracks the number of retransmissions of the heartbeat messages without acknowledgement [Page 365, Section 3.3]. If the number exceeds a threshold, then the link is considered failed [Page 365, Section 3.3].)

Therefore, since *Jungmaier* suggests the use of limited heartbeat acknowledgments, it would have been obvious to a person of ordinary skill in the art at the time of the invention to combine the heartbeats of *Jungmaier* with the system of *Robertson* by acknowledging and re-transmitting heartbeats and declaring a link unavailable after a set number of heartbeats are

unacknowledged. The motive to combine is to allow for bad links to be removed from the system.

Regarding claim 32, *Robertson* discloses re-transmitting heartbeats and a path state storing section for storing path state information of a path state from a home station to each communication station (Page 5, "Heartbeat's Reliable Multicast Protocol") (See also claim 6, Supra). *Robertson* fails to disclose a communication control system further comprising a counting section for counting times of the data transmitting section retransmitting the data and a registering section which, when a count value of the counting section reaches a specified value, determines the communication path as faulty and registers the path state information indicating that the path is faulty, in the path state storing section. In the same field of endeavor, *Jungmaier* discloses a communication control system further comprising a counting section for counting times of the data transmitting section retransmitting the data and a registering section which, when a count value of the counting section reaches a specified value, determines the communication path as faulty and registers the path state information indicating that the path is faulty, in the path state storing section (Page 365, Section 3.3). (The system of *Jungmaier* tracks the number of retransmissions of the heartbeat messages without acknowledgement [Page 365, Section 3.3]. If the number exceeds a threshold, then the link is considered failed [Page 365, Section 3.3].)

Therefore, since *Jungmaier* suggests the use of limited heartbeat acknowledgments, it would have been obvious to a person of ordinary skill in the art at the time of the invention to combine the heartbeats of *Jungmaier* with the system of *Robertson* by acknowledging and re-transmitting heartbeats and declaring a link unavailable after a set number of heartbeats are unacknowledged. The motive to combine is to allow for bad links to be removed from the system.

Regarding claim 33, *Robertson* discloses re-transmitting heartbeats (Page 5, "Heartbeat's Reliable Multicast Protocol"). *Robertson* fails to disclose a communication control system further comprising a counting section for counting times of the data transmitting section retransmitting the data and a switching section which, when a count value of the counting section reaches a specified value, determines the communication path as faulty and switches the communication path. In the same field of endeavor, *Jungmaier* discloses a communication control system further comprising a data transmitting section which transmits data to another communication station, and retransmits the data when a normal reception response is not returned from the another communication station within a predetermined time and a data receiving section for returning a normal reception response to a transmitting source when data is normally received (Page 365, Section 3.3). (The system of *Jungmaier* tracks the number of retransmissions of the heartbeat messages without acknowledgement [Page 365, Section 3.3]. If the number exceeds a threshold, then the link is considered failed [Page 365, Section 3.3].)

Therefore, since *Jungmaier* suggests the use of limited heartbeat acknowledgments, it would have been obvious to a person of ordinary skill in the art at the time of the invention to combine the heartbeats of *Jungmaier* with the system of *Robertson* by acknowledging and re-transmitting heartbeats and declaring a link unavailable after a set number of heartbeats are unacknowledged. The motive to combine is to allow for bad links to be removed from the system.

Allowable Subject Matter

10. **Claims 8, 13-18, 20-22 and 24-25** are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher Crutchfield whose telephone number is (571) 270-3989. The examiner can normally be reached on Monday through Friday 8:00 AM to 5:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Daniel Ryman can be reached on (571) 272-3152. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/Christopher Crutchfield/

Examiner, Art Unit 2466

8/26/2010

/Donald L Mills/
Primary Examiner, Art Unit 2462